



A Multi-Agent Workforce Scheduling System for McDonald's Operations

From online products to physical retail operation, we started by solving workforce scheduling for McDonald's Australia— complex labor laws, unpredictable demand spikes, and limited employee availability through multi-agent collaboration.

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The Scheduling Challenge, Magnified Across 1,000+ Stores

Workforce scheduling is the operational heartbeat of restaurants. For a single store, it's a puzzle. At our scale, it's an exponential challenge affecting hundreds of thousands of employees daily.

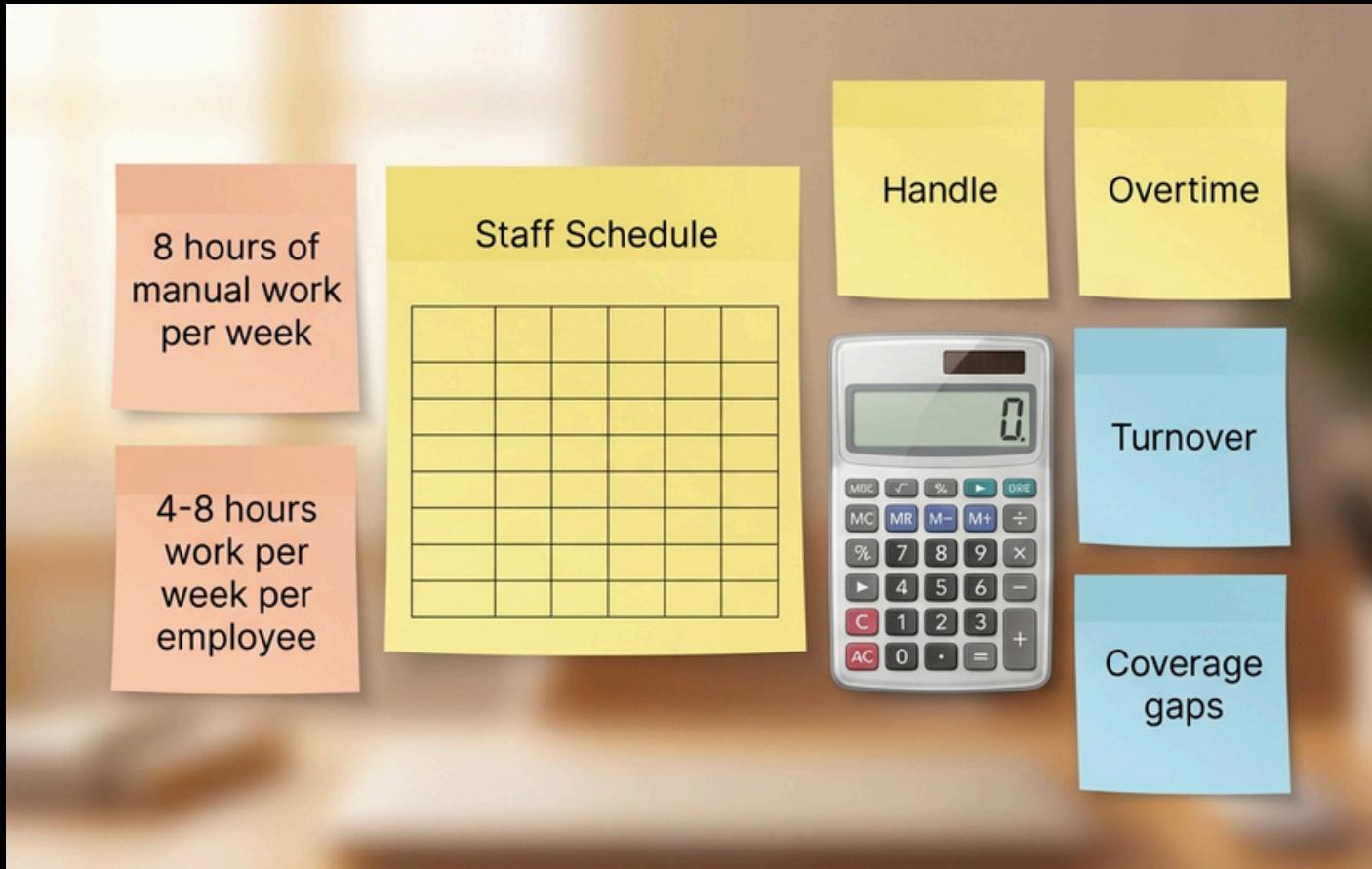
1,000+
Restaurants

~\$250 Million+ AUD
at Risk

All Tiers
Highway, CBD, Suburbs

Multiple Roles
Restaurant Store Managers, Assistant Managers, Crew Members

The Battlefield: From Manual Chaos to AI-Driven System



@ Staff Schedule		Mon	Tue	Wed	Thu
	Christine Race	Morning shift			
	Samea Finnce		Afternoon shift		
	Rani Gennatic	Morning shift		Afternoon shift	
	Sport Tameo	Morning shift		Afternoon shift	
	Bair Shipe	Morning shift		Afternoon shift	
	Dalse Blunch	Morning shift		Afternoon shift	

The Old Way: Manual Scheduling

- **4-8 hours of manual work per week**
- Prone to **coverage gaps & overtime violations**
- Results in **employee dissatisfaction** and high turnover
- Reactive conflict resolution

The New Way: The Algorithmic Manager

- **<180 seconds for a 2-week roster generation**
- Optimized coverage for all peak periods
- Balances business needs with employee preferences
- Proactive conflict detection and automated resolution

Your Mission

Engineer an Intelligent Scheduling System

Design and implement a cutting-edge **multi-agent system to replace traditional, manual restaurant workforce scheduling.**

Your system will leverage real-world operational data to intelligently generate staff rosters that **optimize coverage, respect complex constraints, and resolve conflicts automatically.**

You are not just building a scheduler; you are creating the brain of the modern, efficient algorithmic manager.



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Business Goals

Design Multi-Agent Architectures

- Architect a multi-agent system with clearly defined **agent roles and responsibilities**
- Implement **agent communication protocols and coordination mechanisms**
- Apply appropriate agent architectures (reactive, deliberative, or hybrid)

Apply Constraint Satisfaction Techniques

- Model scheduling as a constraint satisfaction problem (CSP)
- Implement constraint checking and conflict resolution algorithms
- **Balance hard constraints (must satisfy) vs soft constraints (should optimize)**

Optimize Complex Real-World Problems

- Develop optimization strategies for multi-objective scheduling problems
- **Balance competing priorities (coverage, costs, employee preferences)**
- **Implement heuristics for NP-hard scheduling problems**

Integrate Domain Knowledge

- Incorporate **restaurant operations domain knowledge** into system design (**Store Info**)
- Apply labor law compliance requirements (**Australian Fair Work Act**)
- Model real-world business constraints and peak demand patterns



Architect a Society of Intelligent Multi-Agents

Key Concepts to Implement:

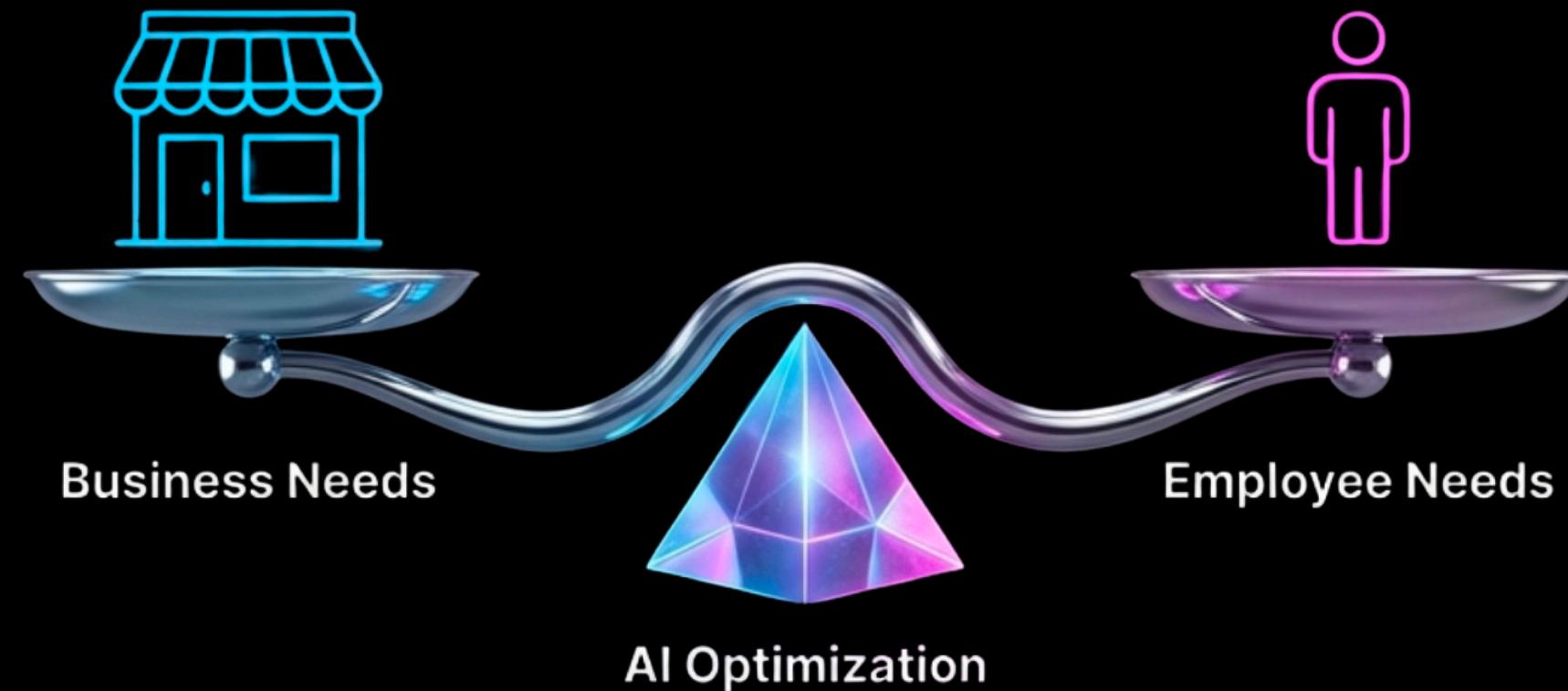
Agent Definition: Clearly define the roles, responsibilities, and decision-making logic for each agent in your system.

Communication & Coordination: Implement protocols for agents to negotiate, share information, and work towards a common goal.

Architecture Choice: Apply the appropriate agent architecture (reactive, deliberative, or a hybrid) to solve the scheduling problem effectively.



Balancing Competing Priorities with Precision

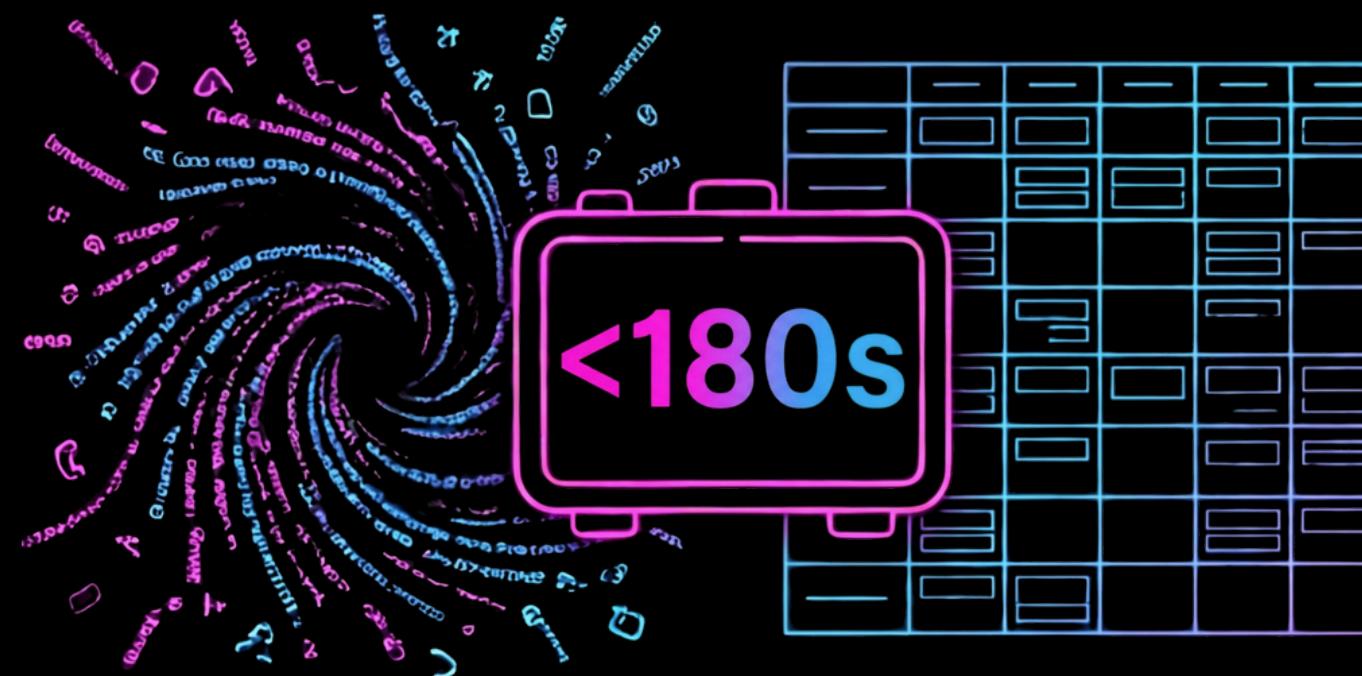


Constraint Satisfaction Problem (CSP)

Model the entire schedule as a complex CSP.

- **Hard Constraints:** Enforce non-negotiable rules (e.g., store info, labor laws, fixed hours, skill requirements for each station).
- **Soft Constraints:** Optimize for desirable outcomes (e.g., employee preferences, minimizing costs).

Success Criteria 1&2 : Intelligent Generation & Peak Coverage



1. Intelligent Roster Generation

Goal: Automatically generate complete, conflict-free weekly/monthly rosters.

Criteria: **Schedules all 40 employees without conflicts in one store**; Complies with 100% of hard constraints; Generates a 2-week roster in under 180 seconds.



2. Peak Period Coverage Optimization

Goal: Ensure optimal staffing during high-traffic periods.

Criteria: Meets minimum staffing for lunch peak(11:00–14:00) & dinner peak (17:00–21:00); **Weekend coverage is 20% higher than off-peak weekdays. Opening (06:30) and closing (23:00) have designated staff**

McDonald's Store Configuration Examples - Different Locations

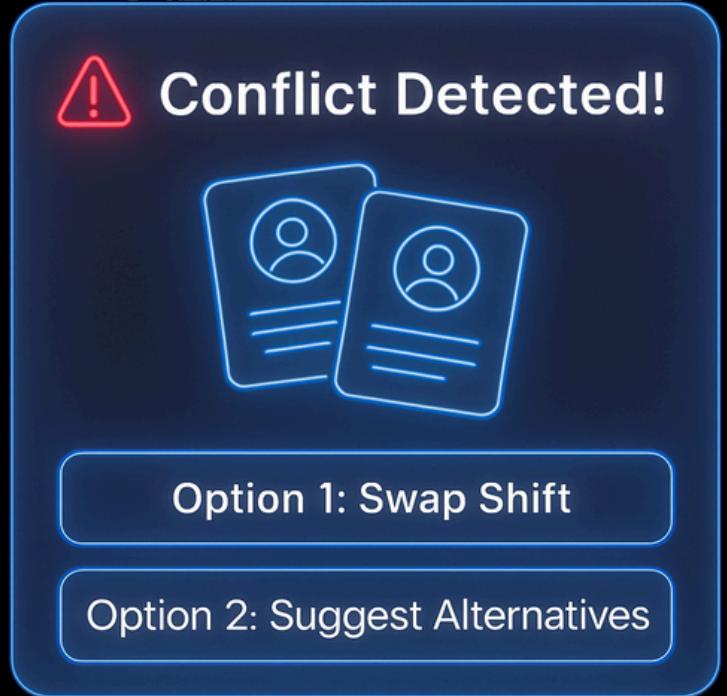
Configuration Item	Store 1: CBD Core Area	Store 2: Suburban Residential
STORE STRUCTURE		
Store Structure	✓	✓
Kitchen	✓	✓
Counter	✓	✓
Multiple McCafé	✓	
Dessert Station	✓	
Offline Dessert Station		
STORE ATTRIBUTES		
Revenue Level	High	Medium
Store Type	Non-24H	Non-24H
OPERATING HOURS		
Opening Time	06:30	07:00
Closing Time	23:00	22:00
Daily Operating Hours	16.5 hours	15 hours
STORE CHARACTERISTICS		
Location Type	CBD Business District	Residential Suburb
Primary Customers	Office workers, Business professionals	Local residents, Families
Peak Hours	7-9 AM, 12-2 PM	Dinner time, Weekends
Coffee Demand	Very High	Medium
Dessert Demand	High (Dedicated station)	Low (No dedicated station)
Traffic Pattern	Weekday peaks	Evening & weekend peaks
Average Daily Customers	1200-1800 people	600-900 people

Fixed Working Hours



Fixed Hours Type	Flexible	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Opening	<input checked="" type="checkbox"/>	2						
Shift Handover	<input checked="" type="checkbox"/>	0.5	0.6					
Closing	<input checked="" type="checkbox"/>	4	4					
Daily Cleaning		1.5	1.5					
Weekly Cleaning		1	1					
Monthly Cleaning								
Inventory/Supply		2	2					
Product Preprocess		2	2					

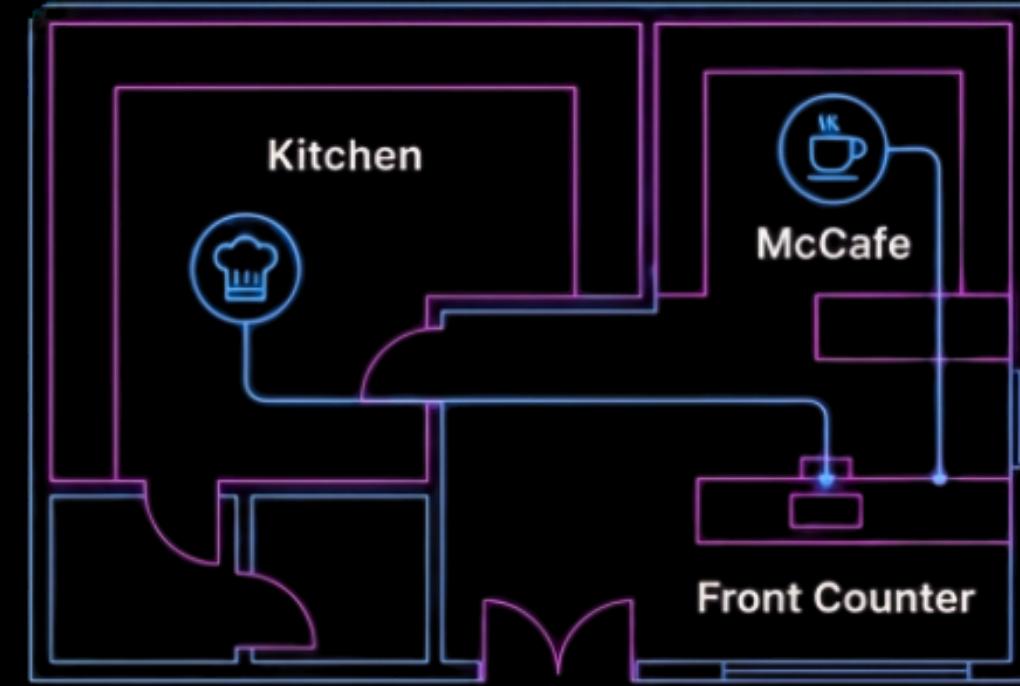
Success Criteria 3&4 : Conflict Resolution & Skill Matching



3. Conflict Detection & Resolution

Goal: Automatically identify and resolve scheduling conflicts for staffs and managers.

Criteria: Detects all constraint violations before finalization; **Provides clear conflict descriptions & ranked resolution options by impacts.**



4. Employee Skill Matching

Goal: Match employee skills to specific station requirements.

Criteria: Assigns only kitchen-trained staff to kitchen shifts; Assigns only barista-certified staff to McCafe shifts; **Cross-trained employees utilized efficiently;** Each station has **at least 1 qualified person per shift**

Employee & Manager Level Availability + Skills Match

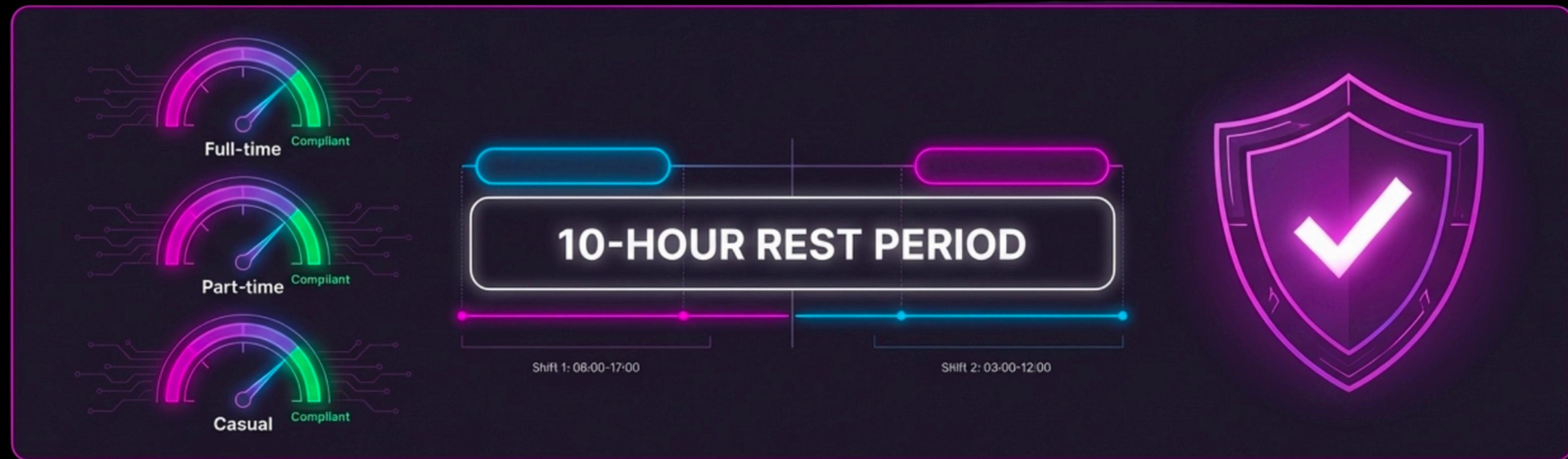
ID	Employee Name	Type	Station	Mon Dec 9	Tue Dec 10	Wed Dec 11	Thu Dec 12	Fri Dec 13	Sat Dec 14	Sun Dec 15	Mon Dec 16	Tue Dec 17	Wed Dec 18	Thu Dec 19	Fri Dec 20	Sat Dec 21	Sun Dec 22	
1001	James Smith	Full-Time	Kitchen	1F	2F	3F	1F	2F	/	3F	1F	2F	3F	1F	/	1F	/	
1002	Emma Johnson	Full-Time	Kitchen	1F	/	3F	1F	2F	1F	3F	1F	2F	/	1F	2F	1F	3F	
1003	Oliver Williams	Full-Time	Kitchen	1F	2F	3F	1F	2F	1F	/	/	/	3F	1F	2F	1F	3F	
1004	Sophia Brown	Full-Time	Kitchen	1F	2F	3F	/	2F	1F	/	1F	2F	3F	1F	2F	1F	/	
1005	William Jones	Full-Time	Kitchen	1F	2F	3F	1F	/	1F	3F	1F	2F	/	1F	2F	/	/	
1006	Ava Garcia	Full-Time	Counter	1F	2F	3F	1F	2F	1F	/	1F	2F	3F	1F	2F	1F	3F	
1007	Jack Miller	Full-Time	Counter	1F	/	3F	/	2F	1F	/	1F	/	3F	/	2F	1F	3F	
1008	Mia Davis	Full-Time	Counter	1F	2F	3F	1F	2F	1F	/	1F	2F	3F	1F	2F	/	3F	
1009	Lucas Wilson	Full-Time	Counter	1F	2F	3F	1F	2F	1F	/	1F	2F	3F	1F	2F	/	3F	
1010	Isabella Anderson	Full-Time	Multi-Station McCafe	1F	2F	3F	/	/	1F	3F	1F	2F	/	1F	2F	1F	3F	
1011	Henry Thomas	Full-Time	Multi-Station McCafe	1F	2F	3F	1F	2F	1F	3F	1F	2F	3F	1F	2F	1F	/	
1012	Charlotte Taylor	Full-Time	Dessert Station	1F	2F	/	1F	/	1F	3F	1F	2F	3F	/	2F	1F	/	
1013	Ethan Moore	Part-Time	Kitchen	2F	/	1F	/	1F	1F	2F	2F	2F	2F	/	/	/	/	
1014	Amelia Jackson	Part-Time	Kitchen	1F	/	2F	/	1F	1F	2F	/	1F	1F	/	1F	2F	/	
1015	Mason Martin	Part-Time	Kitchen	/	2F	1F	1F	/	1F	/	1F	/	2F	1F	2F	1F	/	
1016	Harper Lee	Part-Time	Counter	2F	/	2F	2F	/	1F	2F	1F	/	1F	/	1F	/	/	
1017	Logan Thompson	Part-Time	Counter	2F	1F	2F	/	2F	1F	2F	2F	1F	2F	1F	/	2F	/	
1018	Evelyn White	Part-Time	Counter	/	/	1F	2F	1F	1F	/	2F	/	2F	2F	1F	1F	/	
1019	Alex Harris	Part-Time	Counter	2F	1F	1F	2F	/	1F	/	1F	/	1F	1F	1F	1F	/	
1020	Abigail Clark	Part-Time	Multi-Station McCafe	1F	1F	/	/	2F	1F	2F	2F	2F	2F	1F	2F	1F	/	
1021	Michael Lewis	Part-Time	Multi-Station McCafe	1F	1F	1F	1F	1F	/	/	/	1F	2F	2F	/	1F	2F	/
1022	Emily Walker	Part-Time	Dessert Station	1F	1F	1F	2F	2F	1F	2F	2F	/	2F	1F	/	1F	2F	/
1023	Daniel Hall	Casual	Kitchen	/	1F	/	/	/	/	3F	1F	2F	/	/	1F	2F	2F	/
1024	Elizabeth Allen	Casual	Kitchen	2F	/	/	/	/	2F	3F	/	/	2F	/	2F	/	2F	2F
1025	Matthew Young	Casual	Kitchen	/	/	/	/	2F	3F	2F	/	/	/	/	1F	3F	3F	
1026	Sofia King	Casual	Kitchen	2F	/	/	/	/	2F	/	/	/	/	/	1F	2F	3F	

Employee Name	Position	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu
		25	26	27	28	29	30	31	1	2	3	4
John Smith	Restaurant General Manager	S	/	1F	3F	/	S	3F	/	1F	1F	3F
Sarah Chen	1st Assistant Manager	1F	1F	/	1F	1F	SC	/	1F	1F	1F	/
Michael Wong	1st Assistant Manager	1F	1F	/	S	1F	1F	/	1F	NA	NA	NA
Emma Liu	2nd Assistant Manager	/	2F	2F	2F	/	2F	2F	/	2F	2F	3F
David Zhang	2nd Assistant Manager	3F	3F	/	3F	3F	/	/	2F	3F	3F	/
Lisa Park	Management Trainee	2F	/	3F	/	2F	3F	/	2F	3F	/	2F

Code	Shift Name	Time
S	Day Shift	06:30 - 15:00
1F	First Half	06:30 - 15:30
2F	Second Half	14:00 - 23:00
3F	Full Day	08:00 - 20:00
SC	Shift Change	11:00 - 20:00
M	Meeting	Varies
/	Day Off	-
NA	Not Available	-

Success Criteria 5: Working Hours Compliance

Goal: Monitor and enforce all working hour regulations and contracts



Full-time: 35–38 hours/week.

Part-time: 20–32 hours/week.

Casual: 8–24 hours/week.

System alerts when an employee approaches max/min hours.

Enforces **a minimum 10-hour rest period** between shifts (Australia Fair Work Act).

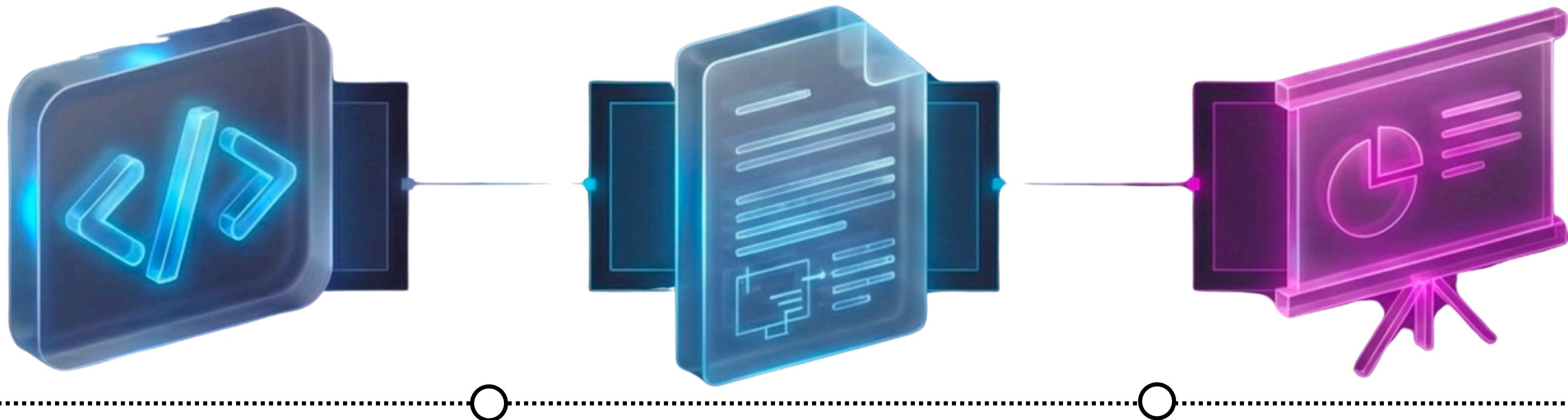
Australian Fair Work Act

Australian Fair Work Act Compliance Notes

Key Compliance Requirements	
1. Minimum Shift Length	Fair Work Act requires minimum 3-hour shifts for casual employees in most hospitality awards
2. Rest Period Between Shifts	Minimum 10 hours rest between shifts as per Fair Work regulations
3. Standard Working Hours	Full-time: 38 hours per week; Part-time: Less than 38 hours with regular roster; Casual: Variable hours with 25% loading
4. Penalty Rates	Saturday: 1.25-1.5x; Sunday: 1.5-2.0x; Public Holidays: 2.25-2.5x; Evening work (after 9 PM): Additional penalties may apply
5. Split Shifts	Must not exceed 12 hours total span; Gap typically 2-3 hours maximum; Additional payment may be required
6. Meal Breaks	30 minutes unpaid meal break for shifts over 5 hours; 10 minute paid rest break for shifts over 4 hours
7. Roster Changes	Minimum notice required for roster changes; Employee consent needed for certain changes; Compensation for cancelled shifts may apply
Important Notes	
Award Reference	These parameters align with the Restaurant Industry Award 2020
Enterprise Agreements	Specific enterprise agreements may have different conditions
Verification	Always verify current award rates and conditions
Classification	Penalty rates vary by classification and experience level
Melbourne Specific	Public holidays in Victoria include Melbourne Cup Day (Melbourne metro only)
Location Context	
Geographic Area	Configuration suitable for Melbourne, Victoria restaurants
Trading Hours	Consider local trading hours regulations
Late Night	Some areas have late-night trading restrictions
Sunday Trading	Sunday trading may have specific requirements



The Proof: Required Deliverables



1. A Functional, Working Prototypes

- **Runnable code (if applicable)**
- Setup and installation instructions
- **Test suite (if applicable)**

2. User Documentation

- System setup guide for administrators
- **API documentation**

3. The Demo

- A live, **3-5 minute demonstration** of your working system.
- Showcase key features
- **Example roster generation (e.g. Excel)**

The Future of Management is Algorithm-Driven.

We are excited to see what you build.



Resources: [Store data access](#)

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